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Digital Jigsaw: Accelerating Critical Thinking and Student Learning Motivation

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Abstract

This study aimed to examine the effect of implementing the Jigsaw cooperative learning model assisted by digital media on improving students' critical thinking skills and learning motivation in Islamic Religious Education at SMP IT Rocha Indonesia Bandung. The study employed a quasi-experimental method using a pretest-post-test control group design. The research sample consisted of 46 ninth-grade students, including 24 students in the experimental class and 22 students in the control class, selected through purposive random sampling. The research instruments included a critical thinking skills test, a learning motivation questionnaire, observation sheets, and documentation. The data were analysed using validity and reliability tests, normality and homogeneity tests, the N-Gain analysis, the Mann-Whitney U test, and the Spearman Rank correlation test. The findings revealed that students' learning activities in the experimental class improved consistently over three instructional meetings, with an average score of 78%, compared to 69% in the control class. The improvement in critical thinking skills was also higher in the experimental class, with an average N-Gain score of 0.85 (high category), whereas the control class achieved 0.68 (moderate category). Furthermore, the implementation of the Jigsaw cooperative learning model assisted by digital media had a positive and statistically significant effect on students' learning motivation, as indicated by a Spearman's rho coefficient of 0.4437 with $p = 0.0298$ ($p < 0.05$). Students also demonstrated highly positive responses toward the learning model, with the majority falling into the very strong response category. Therefore, the implementation of the Jigsaw cooperative learning model assisted by digital media is proven to be effective in enhancing students' critical thinking skills and learning motivation in Islamic Religious Education.

Keywords: Jigsaw cooperative learning; digital media; critical thinking skills; learning motivation; Islamic Religious Education

Abstrak

Penelitian ini bertujuan untuk menganalisis pengaruh penerapan model pembelajaran kooperatif tipe Jigsaw berbantuan media digital terhadap peningkatan keterampilan berpikir kritis dan motivasi belajar siswa pada mata pelajaran Pendidikan Agama Islam (PAI) di SMP IT Rocha Indonesia Bandung. Penelitian menggunakan metode kuasi eksperimen dengan desain pretest-posttest control group. Sampel penelitian berjumlah 46 siswa yang terdiri atas 24 siswa kelas eksperimen dan 22 siswa kelas kontrol yang dipilih melalui purposive random sampling. Instrumen penelitian meliputi tes keterampilan berpikir kritis, angket motivasi belajar, lembar observasi aktivitas belajar, dan dokumentasi. Analisis data dilakukan melalui uji validitas, reliabilitas, normalitas, homogenitas, perhitungan N-Gain, uji Mann-Whitney U, serta korelasi Spearman Rank. Hasil penelitian menunjukkan bahwa aktivitas belajar siswa pada kelas eksperimen mengalami peningkatan selama tiga kali pertemuan dengan rata-rata sebesar 78%, lebih tinggi dibandingkan kelas kontrol sebesar 69%. Peningkatan keterampilan berpikir kritis juga lebih tinggi pada kelas eksperimen dengan nilai rata-rata N-Gain sebesar 0,85 (kategori tinggi), sedangkan kelas kontrol memperoleh 0,68 (kategori sedang). Selain itu, penerapan model pembelajaran kooperatif tipe Jigsaw berbantuan media digital berpengaruh positif dan signifikan terhadap motivasi belajar siswa, yang ditunjukkan oleh nilai korelasi Spearman's Rho = 0,4437 dengan $p = 0,0298$ ($p < 0,05$). Respon siswa terhadap penerapan pembelajaran juga sangat positif dengan dominasi kategori sangat kuat. Dengan demikian, penerapan model pembelajaran kooperatif tipe Jigsaw berbantuan media digital terbukti efektif dalam meningkatkan keterampilan berpikir kritis dan motivasi belajar siswa pada pembelajaran PAI.

Kata Kunci: *model pembelajaran kooperatif tipe Jigsaw; media digital; keterampilan berpikir kritis; motivasi belajar; Pendidikan Agama Islam*

Introduction

Education at the Junior High School (SMP) level, especially for ninth-grade students, is a crucial phase in shaping students' readiness to continue their education to a higher level while simultaneously facing the various challenges of the 21st century. In an era marked by the rapid development of science, technology, and information, students are required not only to master learning materials, but also to have critical and creative thinking skills and a strong motivation to learn as a provision for solving various problems effectively. Therefore, the development of critical thinking skills and learning motivation is a very important aspect of the learning process at school. (Antara, 2024). Low learning motivation is also reflected in suboptimal and inconsistent learning outcomes. Some students earn low grades or experience fluctuating performance without showing any significant effort to improve their learning outcomes (Rizqoh, 2026) .

The above phenomenon is thought to be caused by various factors, but the author places greater emphasis on the use of methods that tend to be monotonous. This is demonstrated by the frequent use of lectures or question and answer methods, where the former is more teacher-oriented, while the latter only attracts a relatively limited number of students. Furthermore, the use of readily available media, such as books and

whiteboards, tends to be dominant and lacks appeal for students who tend to need a variety of media. Therefore, new methods or models are needed, along with the use of attractive media, which are expected to increase students' motivation and critical thinking skills.

As an alternative, researchers use the Cooperative Learning model, which is, as Rusman stated in the journal (Desky et al., 2022), a form of learning in which students learn and work collaboratively in small groups consisting of four to six people with a heterogeneous group structure. Cooperative learning is the use of small groups to maximize their learning and the learning of other members in the group (Zega et al., 2024). *Cooperative learning* procedures are designed to activate students through inquiry and discussion in small groups consisting of 4-6 people (Wahyuni, 2021, 2021). Because the cooperative learning model has a positive impact that allows students to develop knowledge, abilities and skills optimally in a democratic and open learning atmosphere.

According to Anita Lie in (Zahro', 2022) the jigsaw method, like other group learning methods, has interrelated elements, including: Positive interdependence; *Individual accountability*; Face to face interaction; Social skills; Group processing. Meanwhile, the steps for using the jigsaw cooperative learning model include: Students are grouped into groups of 3 to 6 students; Each person in the team is given a different section of material; Each person in the team is given an assigned section of material; members from different teams who have studied the same subsection meet in new groups (expert groups) to discuss their sub-chapters; After completing the discussion, as an expert team, each member returns to the original group and takes turns teaching their teammates about the sub-chapters they have mastered, and each other member listens carefully; Each expert team presents the results of the discussion; the teacher provides an evaluation and closing (Istikarani, 2023).

This jigsaw learning model encourages students to be active, responsible, and improve social and communication skills (Suparwati, 2024) and when combined with digital media, this model becomes more flexible and interactive (Pujianto et al., 2023), accelerates understanding and increases student engagement (Faradillah & Sena, 2024), digitalization of materials becomes an important means to maintain the effectiveness of jigsaw-based learning (Faizin et al., 2025) and ultimately the combination of jigsaw and digital media supports the development of digital literacy, critical thinking skills, and the ability to work together, which are key competencies in the world of modern education. The use of digital media in learning has the function of clarifying learning messages, increasing student attention, and facilitating understanding of the material (Anwar et al., 2022:12).

Critical thinking is the ability to think deeply about various problems or issues within one's scope of understanding, with the aim of gaining a more accurate and comprehensive understanding (Suryaningsih, 2022). According to Robert Ennis in (Syafitri et al., 2021) "*Critical thinking is thinking that makes sense and focused reflection to decide what should be believed or done*" means critical thinking is thinking in a reasoned and reflective manner by emphasizing decision-making about what to

believe and do. The main goal of critical thinking is to achieve a deep understanding so that individuals are able to grasp the meaning behind an idea or event (Fianingrum et al., 2023). In the process of seeking truth, critical thinkers are required to be careful in concluding something, willing to admit the limitations of knowledge, eager to seek new information, patient in exploring data, respect other points of view, and be able to admit when someone else's opinion is more appropriate than their own (Waryanti et al., 2025). Critical thinking is part of practical skills that can help an individual solve problems. Critical thinking also has components, Ennis in (Amalia et al., 2021) mentions several components of critical thinking as follows: *Basic Operation of Reasoning*, *Domain-Specific Knowledge*, *Metacognitive Knowledge Values*, *Beliefs and Disposition*. There are six indicators of critical thinking according to Ennis (Nainggolan et al., 2023) which are well-known with FRISCO, namely: Focus, which is Identifying and formulating problems or questions precisely and clearly, Reason, which is being able to describe the structure of arguments, distinguishing between premises and conclusions, and assessing whether the argument is logical and relevant, Inference, which is being able to evaluate the reliability and objectivity of information sources, be they people, books, or media, Situation, which is being able to identify the assumptions underlying a statement or argument, both explicit and implicit, Clarity, which is being able to interpret data, statements, or situations in a way that makes sense and is supported by evidence, Overview, which is being able to make the right decisions and formulate solutions to problems logically, systematically, and rationally.

Students who are motivated in learning will have a greater sense of enthusiasm in learning. This can be seen from the attitude of students during learning, students will complete it happily and without burden when doing it, this is what is called motivation as a psychological factor (Nursakdiah et al., 2023). Motivation (Hensby & Adewumi, 2024) in the context of education is an internal condition that drives, directs, and maintains student learning behavior. *Self-Determination Theory* (SDT) details that motivation arises from basic needs such as competence, autonomy, and relatedness. Furthermore, indicators of motivation according to Hamzah B. Uno Bastian, 2023 include: first, the desire to succeed. Second, the drive and need to learn. Third, the existence of rewards in learning. Fourth, the existence of interesting activities in learning. Fifth, the existence of a conducive learning environment. Sixth, motivation determines persistence in learning.

Research shows that the implementation of the jigsaw cooperative learning model has been carried out and tested to significantly increase student learning motivation, such as research conducted by (Yuneva, 2024), (Asthiningsih et al., 2020), (Purwaningsih & Harjono, 2023), (Azizah & Ulfah, 2021), (Istikarani, 2023, 2023), (Azura, 2022) and Jauhari (2025) however the majority of research is quantitative or short-term CAR so that longitudinal (long-term) research is rarely found. There is also a gap in technology integration, all research still focuses on physical face-to-face interactions (conventional) and also a gap to research how "Digital Jigsaw" or Jigsaw-based *blended learning* is applied to Islamic religious subjects in the current era of AI and digitalization. Therefore, the purpose of this study is to analyze 1) student learning activities in the application of

the Jigsaw type cooperative learning model based on digital media in Islamic Religious Education subjects, 2) differences in the improvement of students' critical thinking skills between students who use the Jigsaw type cooperative learning model based on digital media and students who do not use the Jigsaw type cooperative learning model in Islamic Religious Education subjects, 3) the significant influence of the application of digital media based on the Jigsaw type cooperative model on students' learning motivation in Islamic Religious Education subjects and 4) student responses to the application of the Jigsaw type cooperative learning model based on digital media in Islamic Religious Education subjects.

Method

Research was done in Rocha Indonesia IT Middle School, Bandung located in Jl. Pandanwangi No.31, Cibiru Wetan, Kec. Cileunyi, Bandung Regency, West Java, post code 40625. The school was chosen because SMP IT Rocha Indonesia Bandung have never used the application of Digital Media in their Learning. This research has been implemented on 1st August sd 20th October 2025. The population taken in the study was the students of eighth grade students in SMP IT Rocha Indonesia Bandung consisting of 120 students. The sample selected two classes by *purposive random sampling* from several classes and the selected classes are IX A with 22 students and IX-B with 24 students. The characteristics of the sample are students that have or will study the material of the Ottoman Empire Civilization and know Digital Media. The research method used is experimental research by choosing one independent variable to see the influence on the dependent variable, where using Digital Media with using and not using Digital Media as the independent variable and critical thinking skills and student motivation as independent variables. This experimental reaearch uses a research design, Quasi Experiment.

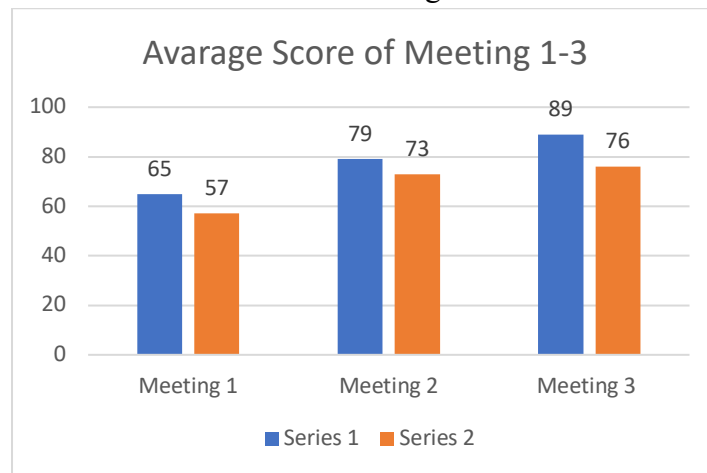
According to Sugiyono (2013), data collection is a crucial step in research because the information obtained must be collected and processed appropriately. This data collection can be done in several ways, namely observation, descriptive tests, and questionnaires to measure student responses to the application of digital media in learning the material of the Ottoman Empire to improve critical thinking skills and student motivation. Data analysis techniques include Analysis of Higher Order Thinking Skills Question preceded by 1) Validity Test, (Eunike et al., 2022) . 2) Reliability Test (Haq, 2022), 3) difference test, (Shofiah et al., 2023). Difficulty Level measured is aimed to know difficult or easy question and measured with a difficulty index between 0.00 to 1.0 to determine difficulty question which tested (Pradita & Megawanti, 2023). Further data analysis according to Arifin (2018) in the form of: 1 testing normality, 2) Homogeneity Test according to Arifin (2018), and 3) Analysis Index Gain (n- gain). Then, further tests were carried out in the form of: 1) Test Paired Sample t- Test , 2) Mann Whitney U Ramadhani Test (2024) . Next, the analysis questionnaire of the Likert scale is used to measure or find out students' responses in the application of Digital Media in learning the material of Ottoman Civilization to improve critical thinking skills and motivation such as According to (Febriyanti & Imami, 2021). Analysis of the results of observations of

student learning activities in learning use Digital Media on the material of the Ottoman Empire Civilization to improve critical thinking skills and student motivation at SMP IT Rocha Indonesia Bandung using the range scale 1 to 4 Masyhud (2013).

Result and Discussion

Student Learning Activities in the Implementation of the Jigsaw Type Cooperative Learning Model Based on Digital Media in Islamic Religious Education Subjects

Observation of the implementation of student learning activities by implementing Digital Media using the Jigsaw type cooperative learning model for the experimental class and the control classes which only use the Jigsaw type Cooperative learning model and without digital media. Both classes are studying the history of Islamic civilization, especially the Ottoman Civilization, and learning carried out to solve a problem in groups consist of 5-6 students who will later complete discussion questions. The experimental class will solve discussion questions using digital media and the control class will use other media. Data in the field shows as in the diagram below:

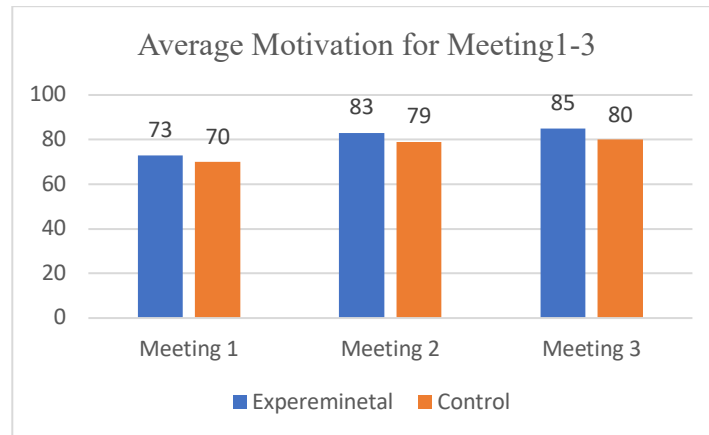


Graph 1. Average Score of Meeting 1-3

Based on the results of the data on the activity scores of the experimental class and the control class students at the first meeting to the third meeting, there was a significant increase where the first meeting to the second meeting of the experimental class had a difference of 14 and the control class had a difference of 16, then the difference at the second and third meetings of the experimental class had a difference of 10 and the control class had a difference of 3. So it can be concluded from the average of the three meetings of the experimental group with an average value of three meetings, 78% with a medium category and the control class with an average of 69% with a medium category. It can be seen from the data that the use of digital media in Islamic History subject,

especially the Ottoman Civilization, can support student learning activities in improving critical thinking skills.

Regarding learning motivation from the first to third meetings, the following data was obtained:



Graph 2. Average motivation for meetings 1-3

Based on the results of the data on the activity scores of the experimental class and the control class students at the first meeting to the third meeting did not show any significant increase where the first meeting to the second meeting of the experimental class with a difference of 10 and the control class with a difference of 9, then the difference at the second and third meetings of the experimental class with a difference of 2 and the control class with a difference of 1. So it can be concluded from the average of the three meetings of the experimental group with an average value of three meetings, namely 80% with a medium category and the control class with an average of 76% with a medium category, it can be seen from the data that the use of digital media in Islami History subject, especially the Ottoman Civilization, can support students' learning motivation.

Based on the results of observations of student learning activities during three meetings, there was a significant increase in learning activities, especially in the experimental class that integrated digital media into the Jigsaw cooperative learning syntax. The increase in learning activities in this experimental class can be explained through the perspectives of Cognitive Load Theory and social constructivism. The use of digital media in the Jigsaw expert group functions to reduce students' extraneous cognitive load when digesting complex historical facts of the Ottoman Civilization. Digital visualization and structured data presentation enable students to quickly identify key points of the problem (Focus), then dedicate their remaining mental capacity to processing rational reasons (Reason) and drawing logical implications (Inference). Cognitive Load Theory was first conceived and developed by Paas (2003), an Australian educational psychologist in 1988. This theory explains that human working memory has a limited capacity and duration. Therefore, learning design must minimize extraneous

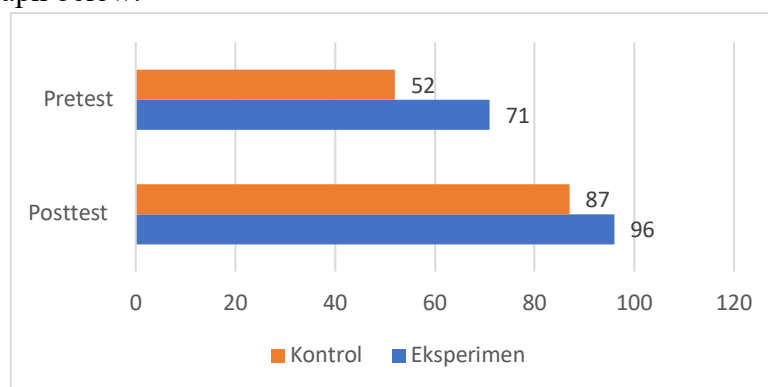
cognitive load so that information processing and the formation of long-term memory schemas can run optimally.

These findings are in line with research of Pratama (2022) who argued that integrating interactive digital platforms into cooperative learning can strengthen group dynamics and encourage student engagement in processing complex information. Furthermore, Aprili & Amelia (2022) emphasized that the use of digital media as a means of supporting discussion can stimulate students' analytical (reasoning) and inference skills because students are required to criticize and filter digital sources before presenting them in group discussions.

Differences of the Improvement of Students' Critical Thinking Skills Between Students Who Use the Jigsaw Type Cooperative Learning Model Based on Digital Media and Conventional Media in Islamic Religious Education Subject

The application of digital media using the Jigsaw Cooperative Model for grade 9 B students at SMP IT Rocha Indonesia Bandung showed different results in the pretest and posttest in the experimental and control classes. Where the pretest was conducted to measure the initial abilities of students who had not been given an understanding of the material by the teacher while the posttest which is the final test to determine changes or improvements in student understanding after studying certain materials to measure students' cognitive regarding the learning that has been delivered by the teacher.

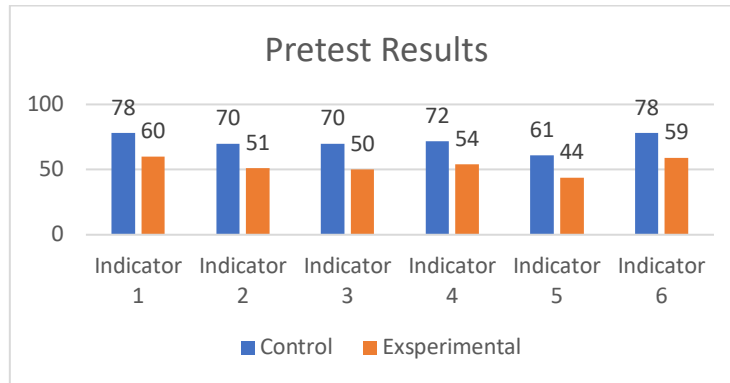
This pretest and posttest was applied in the experimental class using the application of digital media with the Jigsaw Type Cooperative model) and the class that did not apply digital media or only used the Jigsaw Type Cooperative model, namely the control class group. The test refers to the indicators of critical thinking skills using Ennis's critical thinking skills indicators. There are 6 indicators used to measure the pretest and posttest, which are well known as FRISCO (Focus, Reason, Situation, Clarity, Overview). The average value of the Pre-test Post-test of the experimental and control classes can be seen in the graph below.



Graph 3. Average Pre-test Post-test Score

Based on the graphic image above, namely the blue graph as the experimental class and the orange graph as the control class, seen from the difference in pretest and posttest results from the average value of the experimental class pretest with a value of 71 and the control class pretest with a value of 52, this has not met the minimum criteria of KKM, which is 75, then the posttest value of the experimental class is 96 and the

posttest value of the control class is 71. It can be seen that the difference between the pretest and posttest of the experimental class is 25 and when compared with the difference in the control class, which is 35, it can be stated that the experimental class is superior in increasing the average point of the pretest posttest results. The following is the average pretest per indicator.



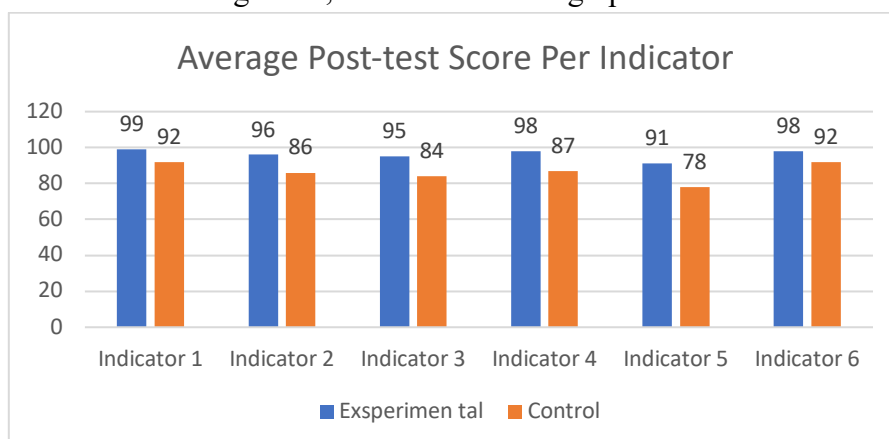
Graph 4. Pretest Results

Information

- Indicator 1 : Focus
- Indicator 2 : Reason
- Indicator 3 : Inference
- Indicator 4 : Situation
- Indicator 5 : Clarity
- Indicator 6 : Overview

Based on the results of the pre-test scores depicted in the graph above, the pre-test results in the experimental and control classes are quite significant, where the experimental group outperformed all five indicators.

The Posttest values of the experimental class and the control class for each indicator of critical thinking skills, it is shown in the graph below.



Graph 5. Average Post-test Score Per Indicator

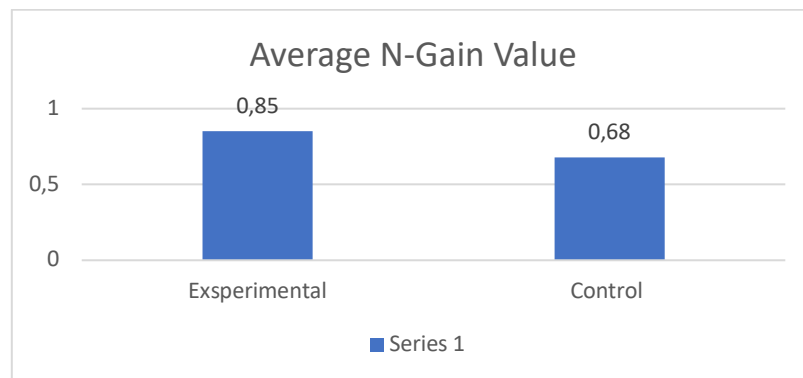
Information

- Indicator 1 : Focus
- Indicator 2 : Reason

- Indicator 3 : Inference
 Indicator 4 : Situation
 Indicator 5 : Clarity
 Indicator 6 : Overview

Based on the results of the post-test values depicted in the graph above, namely the Post-test results in the experimental and control classes, there is a very significant increase in the five indicators, however, the experimental group still outperforms the five indicators.

The N-Gain value data for critical thinking skills of students in the experimental and control classes can be seen from the data below.



Graph 6. Average N-Gain Value

Based on the results of the diagram data above, the average N-Gain value of the experimental class and the control class is quite visible significant comparison of values, namely the N-Gain value of the experimental group is 0.85 and the control class with an N-Gain value of 0.68 if categorized as the experimental class is included in the high category and the control class is included in the medium category. The N-Gain data shows that there is a difference in improvement when applying digital media with the Jigsaw Type Cooperative learning model. The data below is a recapitulation of the N-Gain results of the experimental and control classes.

Interval	Category	Experiment		Control	
		Number Students	ofPercentage (%)	Number Students	ofPercentage (%)
$g > 0.70$	Tall	18	75%	15	68.18%
$0.70 \leq g \leq 0.30$	Currently	5	20.83%	5	22.72%
$g \leq 0.30$	Low	1	4.16%	2	9.09.12%
Total		24	100%	22	100%

Table 1. N-Gain Python Results

Based on the results of the N-Gain test recapitulation of the experimental and control classes, there is a quite significant comparison which can be seen from the interval category and a quite significant percentage in the experimental class, namely the high

category with an interval value of $g > 0.70$ with a total of 18 students with a percentage of 75%, then with an interval of $0.70 \leq g \leq 0.30$ with a medium category with a total of 5 students with a percentage of 20.83%, and with an interval of $g \leq 0.30$ with a low category with a total of only one student with a percentage of 4.16%.

The recapitulation results of the N-Gain test of the control group are quite significantly different from the results of the experimental group, which can be seen from the interval category and the percentage which is quite significant in the control class, namely the high category with an interval value of $g > 0.70$ with a total of 15 students with a percentage of 68.18%, then with an interval of $0.70 \leq g \leq 0.30$ with a medium category with a total of 5 students with a percentage of 22.72%, and with an interval of $g \leq 0.30$ with a low category with a total of 2 students with a percentage of 9.09%.

The prerequisite test was conducted to determine whether the data obtained from the research was normally distributed and homogeneous, which would then be used as consideration in the next stage of statistical testing. The data tested was the N-Gain data obtained from the pretest and posttest results, which were then tested for normality and homogeneity in the experimental and control classes. The table below shows the prerequisite test results.

Data	Class	Normality Test		Homogeneity	
		Sig	Information	Sig	Information
Gain	Control	0.0001	No Normal	0.688	Homogeneous
	Experiment	0.0012	No Normal	0.855	Homogeneous

Table 2. Results of Normality and Homogeneity Tests

Based on the data from the normality test results above, it can be seen that the N-Gain value of the control class is not normally distributed with a significant value of 0.0001 which is smaller than 0.05 and in the experimental class it shows that the N-Gain is not normally distributed with a significant N-Gain value below 0.05, namely 0.0012. The results of the homogeneity test for the control class with a significance value of 0.688 above 0.05 can be seen that the results of the data obtained by the control class are homogeneous, the data obtained from the experimental class, namely the significance value of 0.855 is above 0.05 and it can be seen that the results of the data from the experimental class are homogeneous and not normally distributed.

Based on the prerequisite tests conducted on the N-Gain data, which showed that both classes obtained data that was not normally distributed and homogeneous, a non-parametric test, namely the Mann-Whitney test, was conducted on the N-Gain data difference. The following table shows the results of the N-Gain difference test.

Data	Difference test	Sig	Information
<u>N-Gain</u>	<u>Mann Whitney test</u>	<u>0,000</u>	<u>Significantly Different</u>

Table 3. Results of the Mann-Whiney Difference Test

The Mann Whitney test results presented in the table above show a significant result of 0.000 indicating that the hypothesis H0 is accepted and H1 is rejected because based on the data it can be concluded that there is a significant comparison between students who use digital media and students who do not use digital media in the process of learning of Islamic history subject, especially the Ottoman Civilization to improve thinking skills and student motivation at SMP IT Rocha Indonesia Bandung.

The effectiveness of the Jigsaw model-based digital media application on students' critical thinking skills was measured through the difference in pretest, posttest, and Normalized Gain (N-Gain) scores. The average pretest score for the experimental class was 71 and the control class was 52. Both classes were below the Minimum Completion Criteria (KKM = 75). Meanwhile, the average posttest score after treatment, the experimental class experienced a rapid increase to an average of 96, while the control class reached 71. The increase in posttest scores occurred in all FRISCO indicators. The Clarity (clarity of argument) and Situation (understanding of problem context) indicators in the experimental class experienced the highest spike, from a range of 61%–72% in the pretest to 91%–98% in the posttest.

Analyzing the shift in scores from pretest to posttest, a clear transformation of cognitive structure was evident in the experimental class. In the initial (pretest) stage, students' understanding of the Ottoman Civilization was still fragmentary and shallow. The sharp difference in posttest performance indicates that the digital media intervention in the Jigsaw model not only enhanced factual knowledge but also transformed the way students explored information, predicted historical causes and effects, and critically evaluated evidence.

In contrast, the control class's average posttest score of 71 indicates that conventional cooperative learning alone is not optimal enough to fully exceed the KKM (75). Without access to digital media, developing a deep conceptual understanding takes longer, making the limited duration of class hours a major obstacle to thoroughly testing students' critical argumentation.

Based on Hake's Gain analysis, the average N-Gain of the experimental class was 0.85 (High category), while the control class obtained 0.68 (Medium category). In the experimental class, 75% of students (18 out of 24 students) achieved the high N-Gain criterion level, and 20.83% were in the medium category. In the control class, only 68.18% of students (15 out of 22 students) achieved the high category.

The experimental class's excellence was due to the combined effectiveness of Jigsaw syntax and the flexibility of digital media. The Jigsaw model demands positive interdependence among group members, while digital media facilitates expert group students' in-depth, visual, and multidimensional exploration of Ottoman Civilization data. The data processing and interactive discussions based on digital media significantly honed students' critical reasoning skills.

Methodologically, the difference in N-Gain criteria between the High (0.85) category in the experimental class and the Medium (0.68) category in the control class provides strong statistical evidence regarding the effectiveness of the effect size of the digital media treatment. This point of effectiveness lies in the ability of digital media as cognitive amplifiers. Digital media acts as a data search and processing instrument, so that students' learning time in class is not used up for searching for physical information, but is allocated optimally for higher-order thinking skills activities.

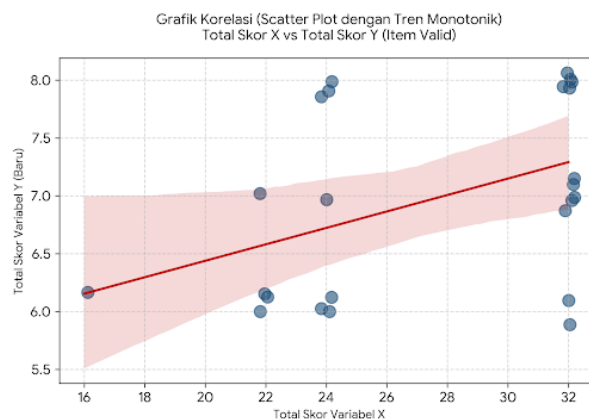
The achievement of 75% of students in the experimental class in the high gain category indicates that the benefits of the combination of digital media and the Jigsaw model are evenly distributed across students' initial cognitive ability levels. There was an even distribution of improvement in critical thinking skills, with students with both moderate and low initial abilities able to catch up thanks to the assistance of digital facilitation and peer collaboration.

The pedagogical implications of the N-Gain results underscore the importance of modernizing history learning strategies at the secondary school level. Integrating digital media into structured learning models like Jigsaw has proven to dismantle the stigma that history learning is passive and declarative. This model successfully transforms the learning landscape into an active inquiry process responsive to the demands of 21st-century skills.

This finding strengthens the study Azizah & Putri (2020) which proves that the application of technology-based learning and digital media combined with a cooperative learning model has a significant impact ($N\text{-Gain} > 0.70$) on improving students' critical thinking skills. A similar interpretation was conveyed by Nasrulloh (2023) which states that digital learning media acts as a cognitive accelerator that makes it easier for students to represent complex problems and draw rational conclusions (inferences).

The Effect of Implementing Digital Media Based on the Jigsaw Cooperative Model on Students' Learning Motivation in Islamic Religious Education Subjects

Relationship between the use of digital media based on jigsaw type cooperative learning with motivation can be measured using Pearson's product moment correlation. In this case, the application of digital media based on jigsaw type cooperative learning is treated as a dependent variable, or referred as variable X, and motivation is treated as an independent variable, hereinafter referred as variable Y. Because the data is not normal, in this calculation, Spearman's correlation is used, which shows the following results:



Graph 7. Correlation

The distribution of questionnaires on the application of digital media with the Cooperative Jigsaw Type model and motivation shows that the Spearman's Rho Correlation value is +0.4437 which means that the direction of the correlation is Positive with the strength of the relationship categorized as sufficient/moderate. This means that there is a reasonable unidirectional tendency: an increase in Variable X is followed by an increase in the value of the valid indicator in Variable Y. The significance value (p-value) is 0.0298 so that because the p-value (0.0298) is smaller than the critical limit of 0.05\$, this relationship is confirmed to be Significant.

Based on the results of Spearman's Rho correlation analysis, the correlation coefficient (rho) value was obtained at +0.4437 with a significance value (p-value) of 0.0298. Because the p value < 0.05 , which states that there is a positive and significant relationship with a sufficient/moderate level of strength between the application of digital media in the Jigsaw type cooperative learning model (Variable X) with student learning motivation (Variable Y) as mentioned above indicates a positive correlation direction indicating that the more optimal the application of Jigsaw-based digital media, the student's learning motivation tends to increase in one direction. This result is in line with the theory of constructivism learning, where the integration of digital technology into the Jigsaw model is able to create an interactive and student-centered learning environment. Jigsaw learning requires each group member to be an "expert" and responsible for teaching the material to their friends, while digital media plays a role in clarifying the visualization of the material and increasing the attractiveness of the learning process.

The increase in motivation in the experimental class is closely related to the fulfillment of three basic psychological needs based on Self-Determination Theory: autonomy, competence, and relatedness. The use of digital media provides students with the autonomy to choose their own methods and rhythms in seeking historical information. When students successfully find and process this information independently, their sense of competence increases, which is then channeled into Cooperative Jigsaw interactions (relatedness). The idea of three basic psychological needs (autonomy, competence, relatedness) is at the core of Self-Determination Theory (SDT) proposed by Richard M. Ryan and Edward L. Deci. Interactive elements in digital media also successfully create a classroom climate that is more conducive and adaptive to various student learning styles (visual, auditory, and kinesthetic). This learning environment rich in digital stimulation has been shown to reduce the level of boredom (learning fatigue) that often occurs in historical material that is rich in dates and long narratives. The increase in the perseverance indicator to 84% at the third meeting indicates that students are motivated to complete the challenging tasks to completion.

On the other hand, the control class showed a relatively modest increase in motivation due to the dominance of static media that lacked the flexibility to respond to students' curiosity instantly. While the Jigsaw model in the control class still provided space for social interaction, the lack of digital media variation made learning stimuli feel monotonous after a few sessions. Consequently, students' learning motivation in the control class was dominated by extrinsic motivations, such as grade demands, rather than intrinsic engagement with the subject matter.

This finding supports research (Parveen & Batool, 2012), Johnson & Johnson (2009), which found that digital transformation in Islamic history learning effectively

increased student engagement and intrinsic motivation. The combination of peer-tutoring social interaction in the Jigsaw model and digital exploration created an interactive classroom climate conducive to independent learning.

Student Responses to the Implementation of the Jigsaw Type Cooperative Learning Model Based on Digital Media in Islamic Religious Education Subjects

The response, which is the feedback given when receiving a treatment being tested, is measured using a data collection tool in the form of a questionnaire, which serves as an instrument for evaluating or measuring the effectiveness of ongoing learning. This questionnaire contains a list of questions to be filled out by the subjects being measured or respondents who have implemented digital media in ongoing learning in islamic history, especially the Ottoman Civilization.

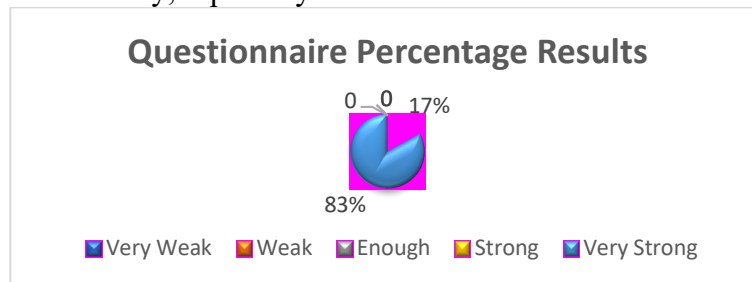
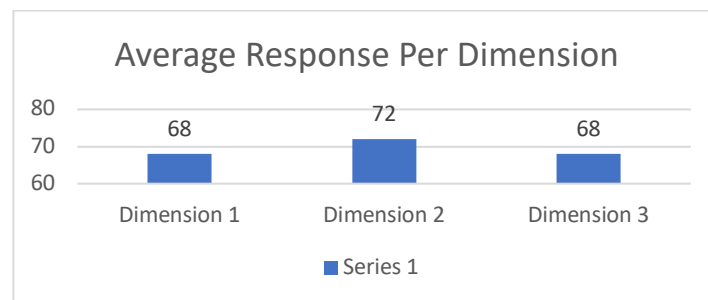


Chart 8. Questionnaire Percentage Results

The image of the percentage results of student responses to the application of digital media with the Jigsaw Type Cooperative model to improve critical thinking skills and student motivation as a whole got 17% strong and 83% very strong responses. Based on the results of these responses, it can be concluded that the application of digital media with the Jigsaw Type Cooperative model to improve critical thinking skills and student motivation at SMP IT Rocha Indonesia Bandung obtained a very strong dominant response of 83%, which means that it has received a good response in the application of digital media in learning Islmic History, especially the Ottoman Civilization.



Graph 9. Average Response Per Dimension

Information:

Indicator 1: Jigsaw Type Cooperative Model + Digital Media

Indicator 2: Critical Thinking Skills

Indicator 3: Motivation

Based on the results of the analysis, it was found that the application of digital media with the Jigsaw Type Cooperative model of Islamic history, especially the Ottoman Civilization to improve critical thinking skills obtained 68% which means it is included in the strong category, then for the response in Critical Thinking Skills the average response reached 72% and is included in the strong category. Finally, motivation obtained

an average response percentage of 68% and is included in the strong category. From the three dimensions, namely the application of digital media with the Jigsaw Type Cooperative model, then critical thinking skills and motivation, it can be seen that overall 80% of students received a good response in the application of digital media with the Jigsaw Type Cooperative model to improve critical thinking skills and student motivation at SMP IT Rocha Indonesia Bandung.

When viewed from each dimension, the Critical Thinking Skills dimension achieved the highest percentage, namely 72% (Strong). This indicates that the division of "expert" roles in Jigsaw syntax supported by digital learning resources successfully stimulated students to analyse and synthesize historical information independently before teaching it to peers. This is in line with Mayer's Cognitive Theory of Multimedia Learning, where the combination of digital text, audio, and visuals accelerates information processing in students' working memory. This finding is also in line with research (Slavin, 2014) which states that cooperative learning is effective in increasing motivation and academic achievement.

Meanwhile, the dimensions of digital media application, jigsaw and learning motivation each achieved a percentage of 68% (Strong). The use of digital media can break the stereotype of rigid and verbalistic history learning, as emphasized by (Zakiya, 2025), (F. Suryaningsih & Khumaira, 2025) stated that digital media provides visual stimulation that strengthens memory retention and students' interest in learning about the history of Islamic civilization.

Conclusion

Student learning activities in the application of the jigsaw type cooperative learning model based on digital media in Islamic Religious Education subjects at SMP IT Rocha Indonesia Bandung were able to improve students' critical thinking skills and motivation from the first meeting to the third meeting. The difference in the improvement of students' critical thinking skills between students who used the jigsaw type cooperative learning model based on digital media and students who did not use digital media was seen from the average N-Gain value of the experimental class of 0.85 and the control class with an N-Gain value of 0.68. If the experimental class is categorized as high, then the control class is categorized as medium. There is a significant influence of the application of digital media based on the jigsaw type cooperative model on student learning motivation as evidenced by the Spearman's Rho value of +0.4437 which means that the direction of the correlation is positive with the strength of the relationship in the sufficient/moderate category. The significance value (p-value) is 0.0298 so that because the p-value (0.0298) is smaller than the critical limit of 0.05\$, this relationship is confirmed to be significant. Meanwhile, students' responses to the application of the jigsaw type cooperative learning model based on digital media are strong as evidenced by the average response per dimension of the application of digital media with the jigsaw type cooperative model of Islamic history, especially the Ottoman Civilization, obtained a score of 68% which means it is included in the strong category, then for the response in critical thinking skills the average response reached 72% and is included in the strong category. Finally,

motivation obtained an average response percentage of 68% and is included in the strong category.

This study has limitations: first, it was conducted in one school with a relatively limited sample size, so the results cannot be widely generalized. Second, the study focused solely on the Ottoman Civilization material, so the effectiveness of the learning model on other Islamic Religious Education (PAI) materials remains unknown. Third, the duration of the study, which lasted three sessions, was not sufficient to describe the long-term impact on the development of students' critical thinking skills and learning motivation. Furthermore, the measurement of learning motivation was still based on a questionnaire, thus relying heavily on the respondents' perceptions and honesty. Future research is recommended to involve a larger sample size and come from various schools with different characteristics to ensure a higher level of generalizability. The study could also be applied to other Islamic Religious Education materials or other subjects to test the consistency of the effectiveness of this learning model. Furthermore, longer-term research is needed to assess the sustainability of improvements in students' critical thinking skills and learning motivation. The development of more interactive digital media, such as the integration of gamification, artificial intelligence (AI), or adaptive learning platforms, could also be an alternative innovation worthy of research to improve the effectiveness of the jigsaw cooperative learning model in the future.

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